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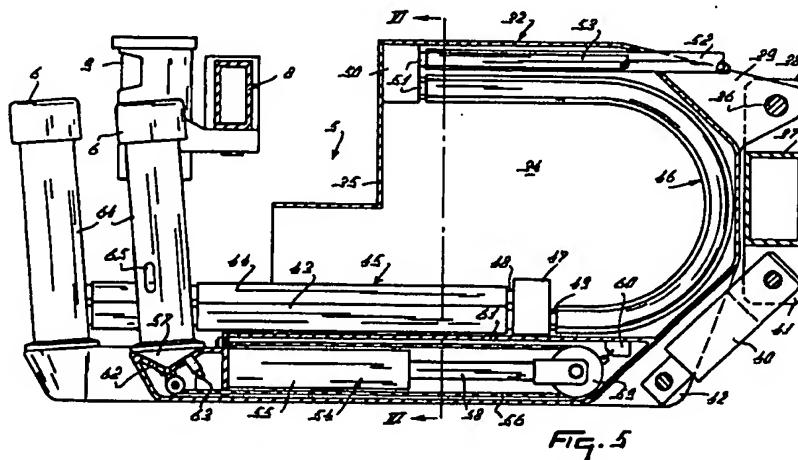
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(54) A construction including an implement for milking animals

(57) The invention relates to a construction including an implement for milking animals, provided with one or more milking parlours where an animal can be milked. The implement comprises at least one sensor (60, 63, 65), which supplies a signal when a teat cup (6).

e.g. because it is kicked off from a teat, gets out of order. The teat cup (6) is detachably disposed on a carrier (32). The sensor (60, 63, 65) is provided in the vicinity of the teat cup (6).



Description

The invention relates to a construction including an implement for milking animals, provided with one or more milking parlours where an animal can be milked.

Such constructions are known.

As these constructions can also be operative without the supervision of a human being, it is advantageous that, when disturbances occur in the implement, these are reported to the operating person.

Therefore the invention aims at obtaining a construction of the above-mentioned type, which is provided with means, by means of which the operating person can be warned that a disturbance has occurred in the implement.

In accordance with the invention, this is achieved in that the implement comprises at least one sensor, which supplies a signal, e.g. to a computer, when a teat cup, e.g. because it is kicked off from a teat, gets out of order. In this manner the operating person can verify, on the basis of computer data, whether a teat cup has got out of order.

According to an inventive feature, the teat cup is detachably disposed on a carrier and the sensor is provided at the place where the teat cup is carried or near thereto. In a preferred embodiment according to the invention, the sensor is disposed in a conical seat of the carrier and the bottom side of the teat cup is conical so as to correspond to the conical seat. When the teat cup has accidentally got out of the conical seat and/or has not returned thereto, this is ascertained by means of the sensor and a computer, whereafter it can be pointed out to an operating person that the relevant teat cup has got out of order. In accordance with again an other inventive feature, a sensor is disposed near a withdrawing member, by means of which the teat cup can be drawn towards the carrier, and the sensor supplies a signal to the computer when the withdrawing member has entirely withdrawn. When, after a pre-fixed period of time, the sensor supplies no signal after the computer has supplied a signal to the withdrawing member to withdraw the teat cup, the computer ascertains that the relevant teat cup has not been withdrawn onto the carrier and consequently has got out of order. According to a further inventive aspect, the withdrawing member comprises a flexible element, such as a cord, which is connected with one end with a teat cup and with the other end with a withdrawing element, such as a cylinder. According to a further inventive feature, a sensor is activated by the end of the piston rod of the cylinder of the withdrawing member. When a teat cup is withdrawn onto the carrier in a proper manner, the sensor supplies a signal indicating that the withdrawal has been carried out correctly. When the end of the piston rod does not activate the sensor, this means that the relevant teat cup has not returned to the carrier and consequently has got out of order. According to a further inventive feature, the sensor is constituted by a micro-switch. In accordance with again an other inventive feature, the

sensor is disposed on the teat cup. According to another further aspect of the invention, the sensor is constituted by a mercury switch. Said mercury switch is preferably disposed on the casing of a teat cup and supplies a signal as soon as the teat cup is pivoted over a pre-fixed angle of e.g. minimum 45° relative to its inoperative position on the carrier. Pivoting of the teat cup over a suchlike angle usually implies that the teat cup has been kicked off or has fallen off and, as a result, is threatened to fall onto the floor. Upon receiving a signal from the sensor provided on the teat cup, the computer supplies a signal to the withdrawing member, in order that the relevant teat cup is withdrawn to the carrier as quickly as possible and thus is prevented from falling onto the floor. By means of the sensor on the carrier and/or the sensor near the piston rod, it can be verified whether the withdrawal of the teat cup has been carried out correctly.

In accordance with again a further inventive feature, the implement comprises a vacuum sensor capable of determining the vacuum in the vacuum line of the teat cup and which supplies a signal to the computer when a teat cup is disconnected from a teat, whereafter the computer supplies a signal to the shutting off means which shut off the vacuum line, in order that the vacuum in the teat cup is removed. The aforementioned sensors are in particular advantageously applicable in an automatic milking implement including a milking robot. According to a further inventive feature, the implement comprises a milking robot, by means of which teat cups can automatically be connected from the carrier to the teats of an animal to be milked, respectively be disconnected therefrom, and be brought back to the carrier by means of the withdrawing member.

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:

Figure 1 shows in plan view an implement for milking animals, provided with a milk box, a milking robot and a collecting member for the dung;
 Figure 2 is a side view of the implement shown in Figure 1;
 Figure 3 is a rear view of the implement shown in Figures 1 and 2;
 Figure 4 shows a detail of a milking robot according to Figure 1;
 Figure 5 is a cross-sectional view of the robot arm taken on the line V - V in Figure 4, and
 Figure 6 is a cross-sectional view of the robot arm according to the line VI - VI in Figure 4.

Figure 1 shows in plan view an implement for milking animals, including a milk box 1 provided with an entrance door 2, an exit door 3 and a feed trough 4. At the opposite sides of the entrance door 2 and the exit door 3, beside the fencing of the milk box 1, there is arranged a milking robot 5, by means of which teat cups

6 can automatically be connected to the teats of an animal 7, respectively be disconnected therefrom.

As shown in Figure 1, beside the milking robot 5 there is further arranged a second robot arm 8 provided at its end with a detector 9, by means of which the position of the teats of an animal to be milked can be determined. In the present embodiment, the detector 9 is designed as a laser making a scanning movement in a horizontal plane. Of course it is also possible to apply an other type of detector, such as an ultrasonographic sensor. The milking robot 5 and the second robot arm 8 can be active independently of each other.

Near the rear side of the milk box 1 there is further disposed a collecting member 10 for collecting the dung of the animal 7 (Figure 3). The collecting member 10 comprises a gutterlike housing 11 which, near its lower side, is provided with a lug 12 which is pivotably connected about a horizontal shaft 13 with a second lug 14. Thereby the first horizontal shaft 13 extends in the longitudinal direction of the milk box 1. The second lug 14 is further pivotable about a second horizontal shaft 15, which is disposed in a U-shaped profile 16 transversely to the longitudinal direction of the milk box 1. The U-shaped profile 16 is fastened on the floor 17 of the milk box 1. Between the floor 17 and the second lug 14 there is further disposed a first cylinder 18 extending in the longitudinal direction of the milk box 1. One end of the first cylinder 18 is pivotably connected with the second lug 14 about a third horizontal shaft 19 and the other end thereof is pivotably connected with the floor 17 about a fourth horizontal shaft 20. The third horizontal shaft 19 and the fourth horizontal shaft 20 both extend transversely to the longitudinal direction of the milk box 1 and are both disposed in U-shaped profiles.

To the gutterlike housing 11 there is fitted a third lug 21 to which, pivotably about a fifth horizontal shaft 22 extending in the longitudinal direction of the milk box 1, there is attached a second cylinder 23. With its other end, the second cylinder 23 is connected, pivotably about a sixth horizontal shaft 24, also extending in the longitudinal direction of the milk box 1, with the second lug 14.

By means of the first cylinder 18, the collecting member 10 can be pivoted about the second horizontal shaft 15 in the longitudinal direction of the milk box 1 and, by means of the second cylinder 23, the collecting member 10 can be pivoted about the first horizontal shaft 13 in the transverse direction of the milk box 1.

The gutterlike housing 11 comprises a triangular bottom 25 made of a plate, one point of which extends obliquely downwards from the cow. Thereby said point of the triangular bottom 25 debouches over a grid floor 26 provided in the right rear angle of the milk box 1. Under the grid floor 26 there is located a dung discharge gutter 27 connected to a (non-shown) dung cellar. The horizontally extending upper edge of the triangular bottom 25 extends transversely to the milk box 1 and is situated at a height of approximately 1.25 m. The gutterlike housing 11 furthermore comprises, seen in

rear view, a quadrangular back wall 28 made of a plate. Seen in rear view, the first side 29 of the back wall 28 includes an angle of approximately 140° with the horizontal line and the further side 30 includes an angle of approximately 90° with the first side 29. The further side 30 comprises near its upper end a bent part 31 including an angle of approximately 30° with the other part of the further side 30.

The collecting member 10 is additionally provided with a (non-shown) cow tracking device, by means of which the milking robot 5 can be post-controlled when the animal 7 moves in the longitudinal direction of the milk box 1.

In Figures 4 to 6, the end of the milking robot 5 is shown in detail. The teat cups 6 rest on a carrier 32 which is pivotable about a vertical shaft 33. The carrier 32 comprises four juxtaposed units 34 each carrying near an end a teat cup 6. The units 34 each comprise a boxlike housing 35, which is pivotable about a horizontal shaft 36. By means of two juxtaposed U-profiles 38, the horizontal shaft 36 is disposed on an L-shaped box girder 37 of the milking robot 5. The unit 35 is provided with two lugs 39 which are pivotably disposed about the horizontal shaft 36. Each of the units 34 is individually pivotable about the horizontal shaft 36 by means of a cylinder 40. The cylinder 40 is connected with one end, by means of lugs 41, with the L-shaped box girder 37 and, with the other end, by means of lugs 42, with the boxlike housing 35. The cylinder 40 may also be designed as a step motor.

In the boxlike housings 35 the milk tubes 43 and the pulsation tubes 44 of the teat cups 6 are accommodated. When the teat cups 6 rest on the carrier 32, the milk tubes and pulsation tubes 43, 44 are located approximately in a circular loop in the boxlike housings 35 (Figure 5). A first part 45 of the milk tubes and pulsation tubes 43, 44 extends from a teat cup 6 in a vertical plane and a second part 46 of the tubes comprises a loop-shaped part 46 located in the vertical plane. The first and second part 45, 46 respectively of the tubes 43, 44 are connected to each other by means of a coupling block 47. The first part 45 of the tubes is connected to connecting nipples 48, which are arranged one below the other at one side of the coupling block 47, whereas the second part 46 of the tubes is connected to connecting nipples 49, which are disposed next to each other at the other side of the coupling block 47. By means of the coupling block 47, there is obtained a kink-free connection between the first part 45, where the tubes are located above each other, and the second part 46, where the tubes are located next to each other. Both in the first and second part 45, 46 of the tubes the jackets of the milk tubes and pulsation tubes 43, 44 are interconnected. Furthermore, the jacket of the first part 45 of the tubes is made of a relatively rigid material, so that the teat cup 6 is prevented from falling down too easily. On the other hand, the second part 46 of the tubes 43, 44 is made of a relatively flexible material. As a result, the units 34, without meeting with too much resistance

of the tubes 43, 44, can be moved upwards without kinks being produced. The other end of the second part 46 of the tubes is connected with a second coupling block 50, which is provided with two pairs of superposed connecting nipples 51, to which, on the one hand, the end of the second part 46 of the tubes is connected and, on the other hand, a pipelike milk line 52 and a pipelike pulsation line 53 are connected (Figures 5, 6). By means of the second coupling block 50, disposed in the left upper part of the boxlike housing 35, there is obtained a diversion of 180° for the milk-pulsation tube 43, 44. Like the second part 46 of the tubes, the pipelike milk line and the pipelike pulsation line 53 are situated next to each other.

In the lower side of each boxlike housing 35 there is moreover disposed a withdrawing member 54, by means of which the teat cups 6 can be withdrawn towards the carrier 32. The withdrawing member 54 comprises a cylinder 55, arranged in the lower part of the boxlike housing 35. The withdrawing member 54 is additionally provided with a cord 56 which is connected with one end with the boxlike housing 35 and with the other end with a conical bottom side 57 of the teat cup 6. The cord 56 is further guided over a wheel 59 that is rotatably disposed at the end of the piston rod 58 of the cylinder 55. In the situation shown in Figure 5, the piston rod 58 is entirely pulled out, whereby the wheel 59 touches a sensor 60, designed as a switch, which is disposed against a wall 61 of the boxlike housing 35. By means of the switch 60 there can be recorded whether the cord 56 is entirely stretched so that the teat cup 6 rests on the carrier 32 in a proper manner. When the teat cup 6 rests on the carrier 32, the switch 60 supplies a signal to the computer. When, after a fixed period of time after the cylinder 55 has been activated, no signal is supplied by the switch 60, the cylinder 55 is activated again and, when again no signal is supplied by the switch 60, the computer will give an error message which, by means of e.g. a radiophone, is passed on to an operating person.

Each of the carriers 32 is provided near its end with a conical seat 62 corresponding to the conical bottom side 57 of the teat cup 6. Thereby the conical seat 62 is disposed in the carrier 32 in such a way that, when the lower end of the carrier 32 is located in a horizontal plane, a teat cup 6 put on the conical seat 62 takes a somewhat forwardly inclined position. The angle at which the teat cup 6 is positioned relative to the vertical line lies approximately between 3° and 10° and is preferably 5°. When the teat cup 6 is pivoted about the shaft 36 by means of the cylinder 40 in order to be connected to the teat of an animal to be milked, said teat cup 6 will take a substantially vertical position during pivoting. In this manner it is possible to connect a teat cup 6 to the teat of an animal to be milked by simply pivoting the unit 32.

For the purpose of verifying whether, by activating the withdrawing member 54, a teat cup 6 is put in the conical seat 62 in a proper manner, there is fitted in the

5 conical seat 62 a sensor 63 recording whether the conical bottom side 57 of the teat cup 6 is correctly put in the conical seat 62. The sensor 63 may thereby be designed as a micro-switch or a conductivity sensor. After the computer has supplied a signal to the withdrawing member 54 to withdraw the teat cup 6 onto the carrier, the computer verifies whether, after a pre-fixed period of time, there is supplied a signal by the sensor 63. When no signal is supplied, it is possible, as described above, to draw the attention of the operating person thereto by means of the computer.

10 On the outer casing 64 of the teat cup 6 there is provided a sensor 65, supplying a signal to the (non-shown) computer concerning the angle at which the teat cup 6 is positioned relative to the vertical line. The sensor 65 may thereby be designed as a clinometer or a simple mercury switch. When the teat cup 6 has been pivoted over a pre-set angle, of e.g. 45°, relative to the vertical line, the vacuum in the teat cup is automatically removed by the computer and the withdrawing member 54 is automatically activated in order to withdraw the teat cup 6 onto the conical seat 62, so that the teat cup 6 is prevented from falling onto the floor and becoming dirty. When the teat cup 6, after activating the withdrawing member 54, does not return to the seat 62 after a pre-fixed period of time, which is ascertained by the sensor 60 and/or the sensor 63, this is pointed out to the operating person in the above-described manner. In an implement of the above-mentioned type, the aforementioned sensors 60, 63 and 65 can be applied individually as well as in combination with each other.

Claims

15 1. A construction including an implement for milking animals, provided with one or more milking parlours where an animal can be milked, characterized in that the implement comprises at least one sensor (60, 63, 65), which supplies a signal when a teat cup (6), e.g. because it is kicked off from a teat, gets out of order.

20 2. A construction as claimed in claim 1, characterized in that the teat cup (6) is detachably disposed on a carrier (32), and the sensor (60, 63, 65) is provided at the place where the teat cup (6) is carried or near thereto.

25 3. A construction as claimed in claim 1 or 2, characterized in that the sensor (63) is disposed in a conical seat (62) of the carrier (32), and the bottom side of the teat cup (6) is conical so as to correspond to the seat (62).

30 4. A construction as claimed in any one of the preceding claims, characterized in that a sensor (60) is disposed near a withdrawing member (54), by means of which the teat cup (6) can be drawn towards the carrier (32), and the sensor (60) sup-

plies a signal to a computer when the withdrawing member (54) has entirely withdrawn.

5. A construction as claimed in claim 4, characterized in that the withdrawing member (54) comprises a flexible element (56), such as a cord, which is connected with one end with a teat cup (6) and with the other end with a withdrawing element (55), such as a cylinder.

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6. A construction as claimed in claim 4 or 5, characterized in that a sensor (60) is activated by the end of the piston rod (58) of the cylinder (55) of the withdrawing member (54).

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7. A construction as claimed in any one of the preceding claims, characterized in that the sensor (60) is constituted by a micro-switch.

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8. A construction as claimed in any one of the preceding claims, characterized in that the sensor (65) is provided on the teat cup (6).

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9. A construction as claimed in claim 8, characterized in that the sensor (65) is constituted by a mercury switch.

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10. A construction as claimed in any one of the preceding claims, characterized in that the implement comprises a vacuum sensor capable of determining the vacuum in the vacuum line of the teat cup (6) and which supplies a signal to the computer when a teat cup (6) is disconnected from a teat, whereafter the computer supplies a signal to the shutting off means which shut off the vacuum line, in order that the vacuum in the teat cup (6) is removed.

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11. A construction as claimed in any one of the preceding claims, characterized in that the implement comprises a milking robot (5), by means of which the teat cups (6) can automatically be connected from the carrier (32) to the teats of an animal to be milked, respectively be disconnected therefrom, and be brought back to the carrier (32) by means of the withdrawing member (54).

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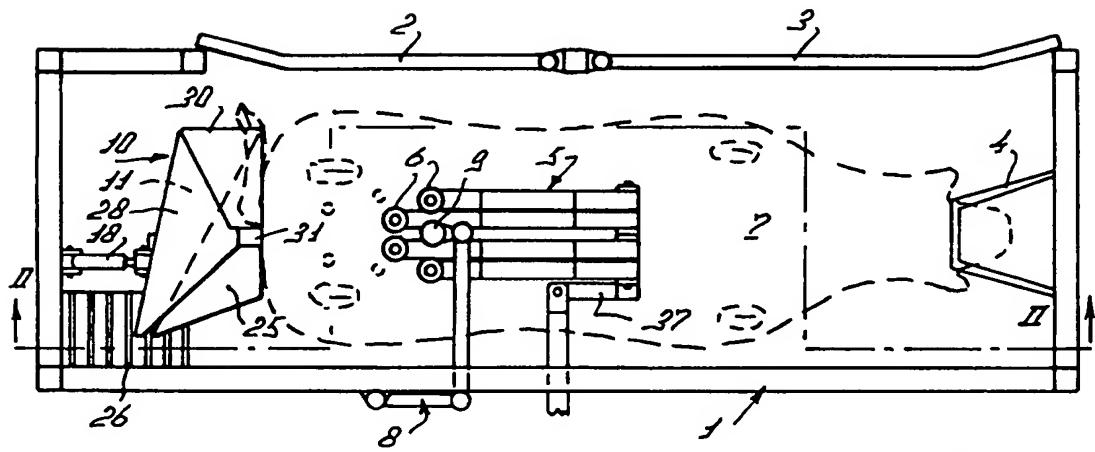


FIG. 1

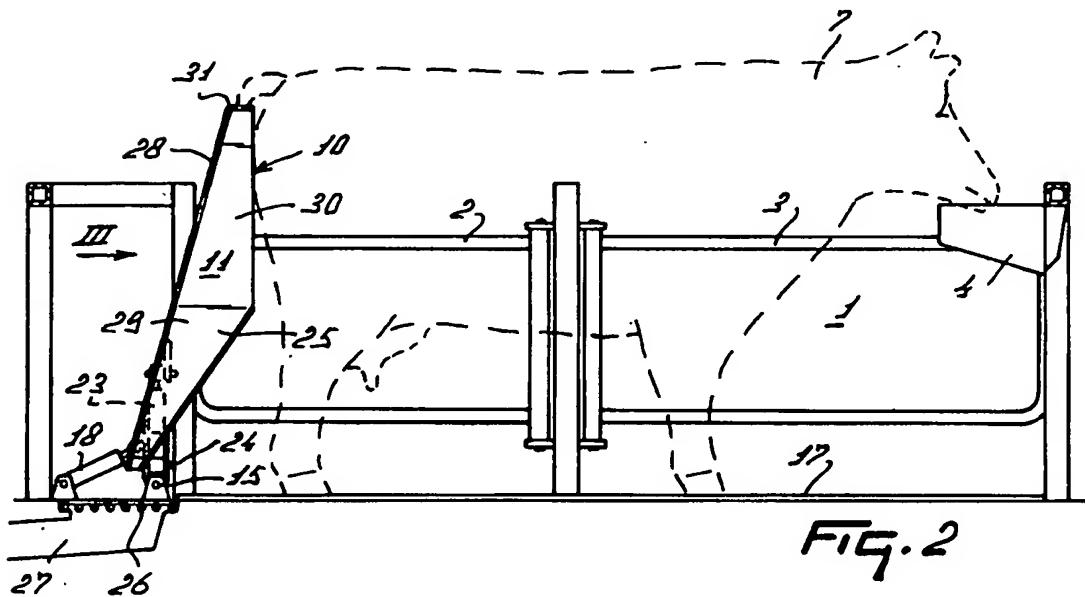
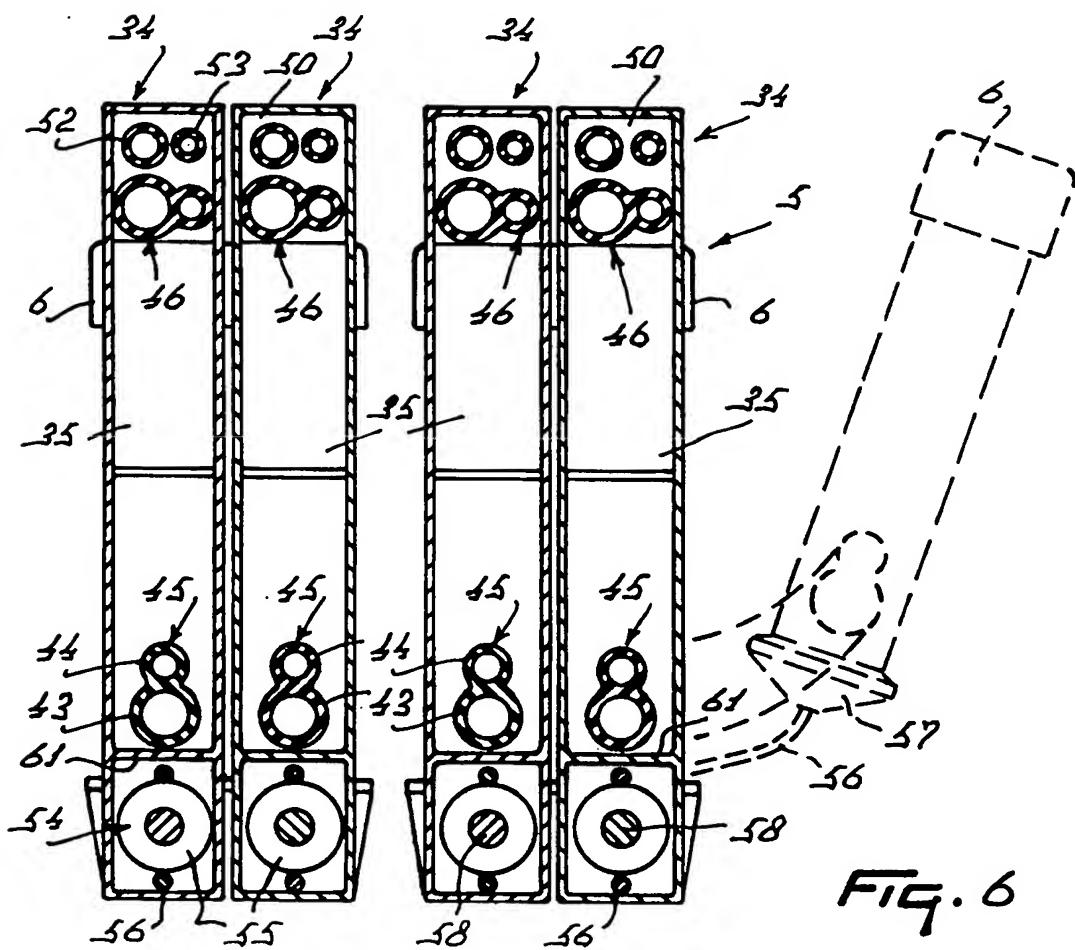
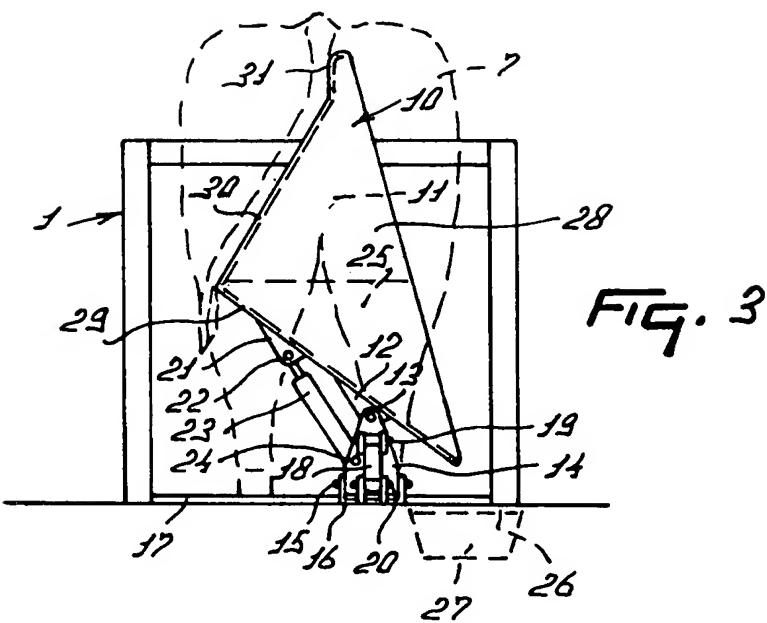
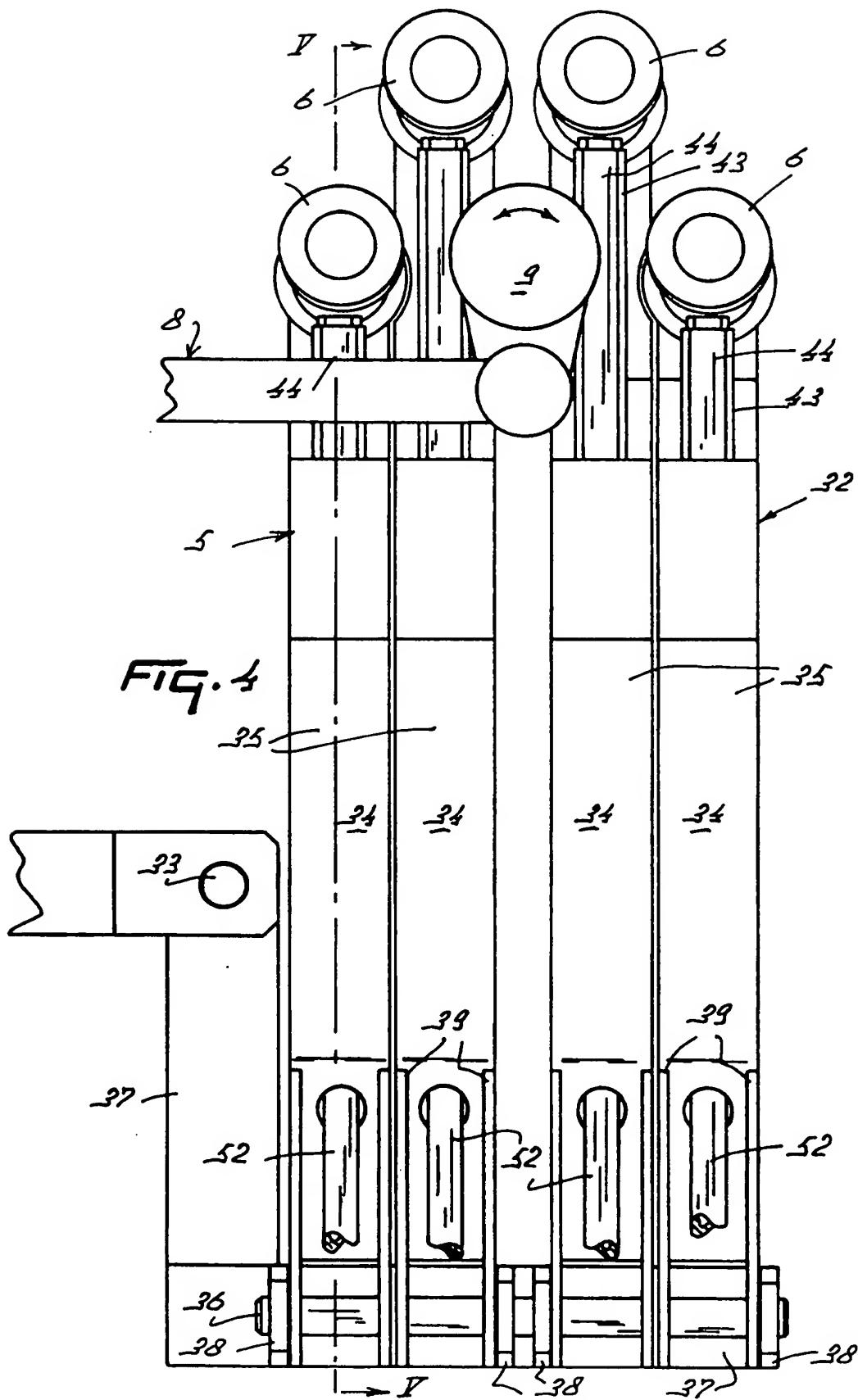
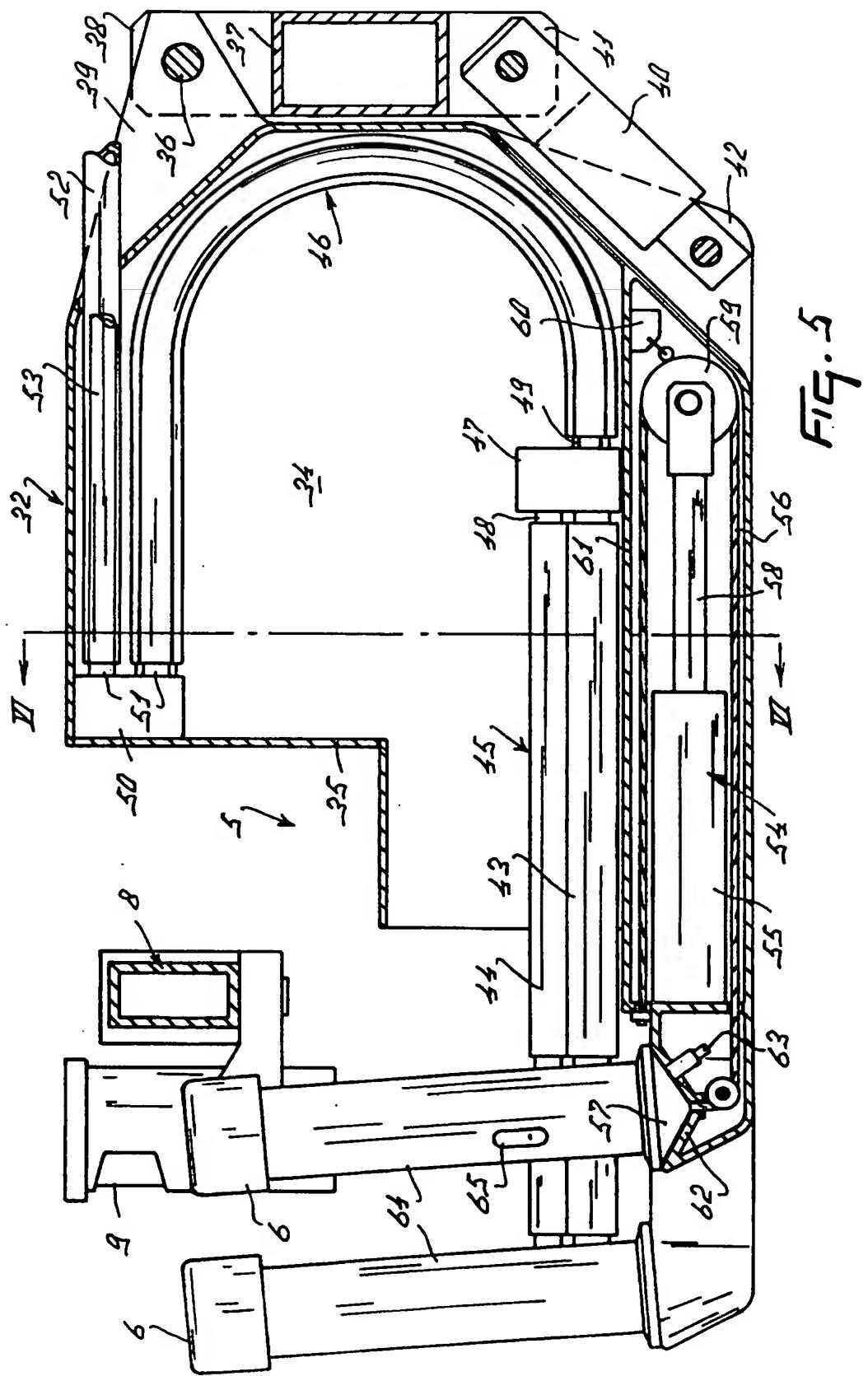


FIG. 2









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EUROPEAN SEARCH REPORT

Application Number
EP 96 20 3145

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	EP 0 534 564 A (VAN DER LELY) 31 March 1993 * column 2, line 28 - column 3, line 39 * * claims; figures * --- EP 0 551 959 A (VAN DER LELY) 21 July 1993 * column 1, line 16 - line 22 * * column 3, line 18 - line 37 * * claims; figures * -----	1	A01J5/017
			TECHNICAL FIELDS SEARCHED (Int.Cl.6) A01J
	The present search report has been drawn up for all claims		
Place of search THE HAGUE		Date of completion of the search 6 February 1997	Examiner
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			